

AP Calculus AB

Syllabus

Course Objectives/Goals

This course is intended to develop the student's understanding of the concepts of calculus, its methods and its applications. The pedagogical approach to the class requires the students to approach all concepts, results, and applications graphically, numerically, analytically, and verbally. The use of technology and unifying mathematical themes such as derivatives, integrals, limits, applications/modeling, and approximation will be used. Students will learn to analytically support data derived from graphs and tables; read a math text; interpret results; support conclusions and communicate mathematics effectively in verbal and written form. Prior to studying calculus, students are expected to know and understand certain skills. A list of pre-requisite skills required for the course and a topical outline has been attached.

Instruction

Instruction methods will vary by topic. Direct instruction by the teacher and student presentation will be used to cover material in class. There will be group work and collaboration as well as independent assignments. The graphing calculator is used for demonstration on a daily basis which enables students to see what is being discussed.

Course Design Philosophy

Students do best when they have an idea of the conceptual foundation of calculus. Rather than making the course a long list of skills to memorize, we stress understanding the why of each concept. When students understand the reasons for a concept, they tend to grasp how to apply the concept. The concepts covered include: limits, derivatives, & integrals and the mechanics that go along with each concept.

Primary Text

Calculus, Single Variable; 8th edition; © 2006, by Larson, Hostetler, Edwards

Required Materials for Class

- Textbook
- Pencils and erasers
- Paper (notebook and loose leaf paper)
- Graph paper
- Graphing calculator, preferably a TI-83 or TI-84. A list of approved graphing calculators for the AP Calculus exam is available on the AP Central website (apcentral.collegeboard.com/calculusab)

Attendance

Regular classroom attendance is essential for success. If you are absent, you are responsible for getting missed assignments and turning in any assignments that were due. Class assignments and homework will be posted on my Homework Hero website. You will need to see me to schedule a time to make up any missed tests or quizzes. These can be made up before school, after school or at lunch time.

Homework

The purpose of homework is to help the student understand and master the concepts of calculus. Students should expect a substantial amount of homework to be assigned. If you are absent, you are responsible for getting the missed assignment and turning in any assignments for the days you were out.

Technology Requirement

A TI-84 Plus graphing calculator will be used in class regularly. You are required to have a graphing calculator as well. I recommend the TI-84 and the TI-89. I have a classroom set of TI-84 Plus calculators, and some are available for extended checkout from the media center.

We will use the calculator in a variety of ways including:

- Conduct explorations.
- Graph functions within arbitrary windows.
- Solve equations numerically.
- Analyze and interpret results.
- Justify and explain results of graphs and equations.

Guidelines for Assignments

- Identify your name, date, page and assignment
- State your original problem
- Clearly identify and label your answers
- Show your work in a legible, organized manner
- Do your work in pencil
- Remove ragged edges from spiral notebook paper

Assessments/Grades

Students are assessed through homework, assignments, class preparation, quizzes, exams and projects. Students should expect a quiz at least once a week and an exam once for each chapter. In preparation for the AP Exam, the quiz/test may consist of calculator and non-calculator portions involving multiple choice and free-response questions.

Academic Honesty

The work you submit must be your own. Students who copy someone else's work or allow someone else to copy their own work will be given zero credit for that assignment and a disciplinary note will be filed. When students are working in groups, collaboration is expected. However, each student is expected to make a genuine contribution to the assignment.

Released AP Exam Questions:

As the course progresses, students acquire sufficient knowledge to be able to answer various AP Exam questions. Over the course of the year, students answer multiple choice question from previous AP Exams either as classwork, review, or on an exam. (These are the multiple choice questions that have currently been released.) Additionally, students answer approximately 60 free response questions from exams ranging over the last twenty years.

A Balanced Approach

Current mathematical education emphasizes a "Rule of Four." There are a variety of ways to approach and solve problems. The four branches of the problem-solving tree of mathematics are:

Numerical analysis (where data points are known, • but not an equation)

- Graphical analysis (where a graph is known, but again, not an equation)
- Analytic/algebraic analysis (traditional equation and variable manipulation)
- Verbal/written methods of representing problems (classic story problems as well as written justification of one's thinking in solving a problem—such as on our state assessment)

Course Outline

Prerequisites for Calculus

Time: 2 days

- Test of Chapter P
- Review of First Test

Limits and Continuity

Time: 8 days

- Lab: Limits of Functions
- Develop an intuitive understanding of the nature of limits
- Lay the foundation for the use of limits in Calculus
- Evaluate limits analytically, graphically, numerically and verbally
- Rates of change and limits
- Limits involving infinity
- Continuity
- Rates of change and tangent lines
- Test

Derivatives

Time: 12 days

- Derivative of a function
- Differentiability
- Rules for differentiation
- Velocity and other rates of change
- Derivatives of Trigonometric Functions
- Chain Rule
- Implicit Differentiation
- Derivatives of Inverse Trigonometric Functions
- Derivatives of Exponential and Logarithmic Functions

- Test

Applications of Derivatives

Time: 11 days

- Extrema Values of Functions
- Mean Value Theorem
- Rolle's Theorem
- Connecting f' and f'' with the Graph of f
- Modeling and Optimization
- Linearization and Newton's Method
- Related Rates
- Test

Integrals and the Definite Integral

Time: 11 days

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- Indefinite Integrals
- Estimating with Finite Sums
- Definite Integrals
- Definite Integrals and Antiderivatives
- Fundamental Theorem of Calculus
- Riemann Sums
- Trapezoidal Rule
- Test

Differential Equations and Mathematical Modeling

Time: 8 days

- General Differential Equations
- Slope Fields and Euler's Method
- Antidifferentiation by Substitution
- Exponential Growth and Decay
- Logistic Growth
- Test

Applications of Definite Integrals

Time: 10 days

- Integral as Net Change

- Areas in the Plane
- Volumes
- Applications from Science and Statistics
- Test

AP Review

Time: 6 days

- We will try many free-response questions from previous AP Calculus Tests
- We will review all previously covered topics

Post AP Calculus Exam

Time 8 days

- Antidifferentiation by parts
- Lengths of Curves
- L'Hopital's Rule (May be covered previous to AP Exam)
- Additional Projects

This schedule leaves time for flexibility and teaching time management.